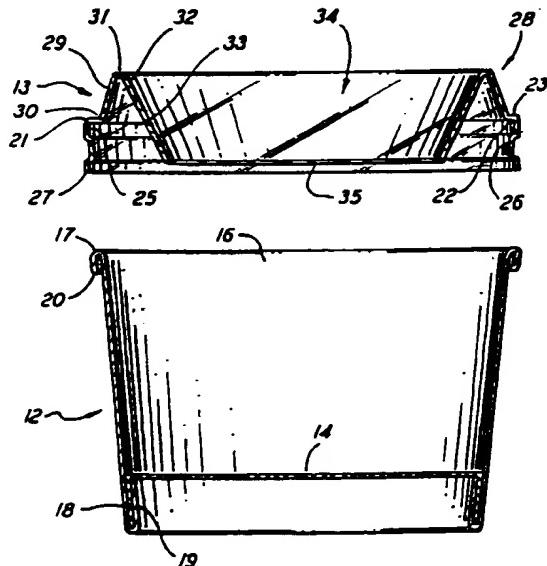




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(22) International Filing Date: 22 January 1990 (22.01.90)		(75) Inventor/Applicant (for US only) : TIMM, Timothy, L. [US/US]; 2185 Woodcrest Court, Green Bay, WI 54304 (US).
(30) Priority data: 306,302 3 February 1989 (03.02.89) US		(74) Agents: BOLAND, William, T. et al.; Kenyon & Kenyon, One Broadway, New York, NY 10004 (US).
(60) Parent Application or Grant (63) Related by Continuation US Filed on 306,302 (CIP) 3 February 1989 (03.02.89)		(81) Designated States: AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), SE (European patent), US.
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(54) Title: FROZEN ICE CREAM CUP WITH INVERTIBLE LID FOR HOT SUNDAE TOPPING



(57) Abstract

A package (11) for a sundae-type frozen dessert includes an open-top container (12) and a dished cap (13) for the container. The cap has a skirt portion (24) that extends from one side (22) of an annular shoulder (21) and a pilot portion (29) that extends from the opposite side (23) of the shoulder portion to an annular crown (28) that surrounds an open cup portion (34). The skirt portion snaps over the rim (17) of the container when the cap is in a normal position, with the one side (22) of the shoulder resting on the container rim. The pilot portion (29) makes a loose telescopic fit within the top of the container when the cap (13) is in an inverted position, with the opposite side (23) of the shoulder resting on the container rim (17). After the container is partially filled with a dessert mix (36), the cap is fitted onto the container in the normal position, the cup portion is filled with a topping (39) and covered with a seal (40). The completed package is then frozen. To prepare for eating, the cap is inverted on the container after removal of the sealing cover, and the package is placed in a microwave oven (41) until the topping melts and pours down onto the frozen dessert mix. The cap is then removed, and the hot sundae is ready for eating directly from the container.

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-1-

FROZEN ICE CREAM CUP WITH INVERTIBLE
LID FOR HOT SUNDAE TOPPING

5

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a package containing a frozen dessert portion and a frozen flavored topping, 10 the package being arranged to allow the topping to melt while the dessert portion remains substantially frozen, when the frozen package is placed in a microwave oven for a predetermined time.

Related Art

15 The increasing popularity of microwave ovens has led to the development of prepackaged frozen food items that can be heated in such ovens while still in the package so as to be ready for directly serving from the package in a short time and with minimum fuss.

20 A particularly challenging problem has been to provide a package for a sundae-type of frozen dessert with a flavored topping that, when the package is placed in a microwave oven will allow the topping to melt while preserving the dessert in a firm substantially frozen 25 state. Various solutions to this problem are disclosed in U.S. Patents No. 4,789,552 of SPEAKMAN et al.; No. 2,714,070 of WELCH; No. 4,233,325 of SLANGAN et al.; and No. 4,794,008 of SCHMIDT et al.

SPEAKMAN et al. take a straightforward

-2-

- approach of lining the sides and bottom of a plastic or cardboard microwave-transparent ice cream container with a layer of flavored topping, partially filling the lined container with a core material such as ice cream,
- 5 custard, ice milk, yogurt, a flavored ice, or pudding, and adding a layer of topping to fill the container. The result is a serving of ice cream or similar dessert coated with a flavored topping material within the container. By appropriate selection of relative
- 10 densities and solids content of the two components, when the frozen package is placed in a microwave oven for a short time, the topping will soften while the core remains frozen.

The entire container of the SPEAKMAN et al.

15 package is permeable to microwaves so that the topping surrounding the ice cream or other frozen dessert will be uniformly heated. WELCH, SLANGAN et al., and SCHMIDT et al. provide packages that have microwave permeable portions and microwave reflective portions to

20 selectively restrict the delivery of heating energy primarily to a flavored topping portion while shielding a frozen dessert portion. The packaging system in each of these patents includes an open top container that is substantially opaque to microwaves. This container holds

25 a portion of dessert mix.

WELCH places a layer or wafer of cake or cone on top of the dessert mix portion, followed by a layer of sauce. The package is then sealed with a paper cover and frozen. To prepare for eating, the paper cover is

30 removed, and the container is placed in a microwave oven for a long enough period to heat the topping to a desired temperature. The topping layer absorbs most of the microwave energy, and the cake or cone material insulates the frozen dessert mix from conductive heat

35 from the sauce.

SLANGAN et al. provide a two-compartment

-3-

- package made up of a shallow cup nested within a larger open top container. The container and the side wall of the cup are transparent to microwaves; the bottom of the cup is a microwave reflective material such as metal
- 5 foil. After the container has been partially filled with a dessert mix, the cup is fitted into the top of the container and filled with a syrup or topping. The top of the cup and container is then sealed with a transparent snap-on cover, and the package is frozen.
- 10 To prepare the frozen package for serving, it is placed in a top-fed microwave oven. The microwave energy reaches the topping through the transparent cover, but it cannot penetrate the base of the cup to melt the frozen dessert. The container may also be made of a
- 15 microwave resistant material to further shield the frozen dessert. When the topping is sufficiently heated, the cover is removed and the bottom of the upper cup is punctured so that the topping can flow into the container. Alternatively, the cup may be provided with
- 20 a handle, so that after the topping is melted, the cup can be lifted out of the container and the hot topping poured directly onto the frozen dessert in the bottom portion of the container. The cup is then thrown away, and the hot sundae eaten directly from the container
- 25 without interference from broken edges of the bottom of the cup.

SCHMIDT et al. also partially fill a microwave impervious open top container with a dessert mix, which is then frozen. A domed microwave-
30 transparent cap is inverted and filled with a topping, which is also then frozen. The open end of the cap with frozen topping is fitted to the rim of the container of frozen dessert to produce a sealed package with the topping in the cap separated by an open space from the frozen dessert portion in the bottom of the container.
35 To prepare the contents for eating, the frozen package

-4-

is simply placed in a microwave oven for a predetermined time. The microwave energy is absorbed by the frozen topping that lines the inside of the domed cap. The topping is heated and melts, dropping down onto the
5 still frozen dessert mix. The empty cap is then unsealed from the rim of the container and discarded.

SUMMARY OF THE INVENTION

The present invention provides a microwaveable
10 package for a sundae-type frozen dessert that includes elements and features not shown or suggested in the above-described patents and which are advantageous both for economy and simplicity of production and for ease and reliability of use by the consumer.

15 In particular, the present invention provides a package for a microwaveable sundae-type frozen dessert, the package comprising:

an open-top container having a circumferential top rim (e.g., an open end with an upper edge);
20 a cap or lid of microwave-energy-permeable material, the cap having a normal position and an inverted position, the cap including

an annular shoulder having a first surface that rests on the rim of the container when the cap is
25 in the normal position and a second surface or peripheral shoulder portion that rests on the rim of the container when the cap is in the inverted position;

a central cup portion or concave surface that opens upwardly when the cap in the normal position, the
30 cup portion having a bottom and a peripheral wall coupled to the annular shoulder;

a first peripheral portion (or peripheral rim portion) having a surface that extends axially from the first surface of the annular shoulder and mates with the
35 rim of the container when the cap is in the normal position; and

-5-

- a second peripheral portion having a surface that extends axially from the second surface of the annular shoulder and mates with the rim of the container when the cap is in the inverted position. In a
- 5 currently preferred embodiment, the cap includes a circumferential outer skirt portion having an upper end, a lower end, and an inner surface that fits closely over the outside of the rim of the container when the cap is in the normal position;
- 10 a pilot portion having an upper end, a lower end, and a circumferential surface that mates telescopically within the rim when the cap is in the inverted position;
- 15 an annular shoulder connecting the upper end of the skirt portion to the lower end of the pilot portion, the shoulder having a lower surface that rests on the rim of the container when the cap is in the normal position and an upper surface that rests on the container rim when the cap is in the inverted position;
- 20 and
- a central cup portion that opens upwardly when the cap is in the normal position.
- The invention also provides a process for packaging an ice cream sundae-type product and for
- 25 preparing the product for eating directly from the package, the process comprising:
- (a) providing an open-top container having an upper peripheral rim or edge;
- (b) partially filling the container with a
- 30 flowable dessert mix;
- (c) providing a microwave-energy-permeable dished or concave cap or lid for the container, the cap having a radially extending annular shoulder, a first peripheral surface or peripheral rim portion extending
- 35 in a first axial direction from the shoulder and making a tight sealing telescopic fit with the open top of the

-6-

- container when one side of the shoulder rests on the container rim, a second peripheral surface or peripheral shoulder portion opposite the peripheral rim portion and extending in a second axial direction from the shoulder
- 5 and making a loose telescopic fit with the open top of the container when an opposite side of the shoulder rests on the container rim, and a central cup portion or concave surface with an open end that faces the second axial direction;
- 10 (d) fitting the first axially extending portion of the cap to the open top of the container after step (b), with the one side of the shoulder resting on the container rim;
- (e) pouring a melted topping into the central
- 15 cup portion of the cap;
- (f) placing a sealing cover on the open end of the central cup portion;
- (g) freezing the sealed package;
- (h) removing the sealing cover from the cap of
- 20 the frozen package when the product is to be eaten;
- (i) removing the cap from the container, inverting the cap, and fitting the second axially extending surface of the cap to the open top of the container with the opposite side of the shoulder resting
- 25 on the container rim; and
- (j) after step (i), subjecting the frozen package to microwave energy for a period of time sufficient to cause the frozen topping to melt and pour down from the inverted cap onto the frozen dessert mix
- 30 in the container.
- In another embodiment, the present invention relates to a microwaveable package comprising a container having an open end with an upper edge and adapted to hold a first frozen food for example ice
- 35 cream, container being substantially impermeable to microwave energy, and a microwave-energy-permeable lid

-7-

for the container adapted for use either in a normal or inverted configuration. The lid in its normal configuration has a concave surface adapted to hold a second frozen food i.e., an ice cream sundae topping.

5 The lid includes a peripheral rim portion adapted to serve as a closure for the open end of said container. More particularly, the peripheral rim portion comprises a flange adapted to make a snap fit with the upper edge of the container. The lid in its inverted configuration

10 includes a peripheral shoulder portion opposite the peripheral rim portion and adapted to rest upon the upper edge of the container when the lid is inverted. The peripheral shoulder is adapted to make a telescopic fit with the open end of said container. The package

15 preferably further comprises removable sealing means for sealing the topping within the concave portion of the lid during storage of the ice cream sundae product. The topping becomes flowable and contacts the ice cream when the package is exposed to microwave energy.

20

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top perspective view of a package for a sundae-type frozen dessert according to the invention;

25 FIG. 2 is an exploded elevation view, in cross section, of a container and cap of the package of FIG. 1;

FIGS. 3a - 3d are schematic drawings showing the principal steps of a process according to the invention
30 for filling and sealing the frozen dessert package of FIG. 1; and

FIGS. 4a - 4d are schematic drawings showing the principal steps of a process according to the invention for preparing a package of frozen dessert
35 ready for eating as a hot topping sundae.

-8-

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to FIGS. 1 and 2, a package 11 for a sundae-type frozen dessert product according to the present invention includes an open-top container 12 and a dished cap 13.

The container 12 has a flat bottom 14 and a frusto-conical side wall 15 that terminates at the open top 16 of the container in a rim 17. The bottom may be formed from a circular piece of cardboard having a turned down edge 18, and the side wall may be formed from a strip of cardboard rolled into a frusto-conical surface, with an edge 19 at the small diameter end of the surface turned inward and folded over the turned down edge 18 of the bottom, and with an edge 20 at the large diameter end of the surface rolled outwardly to form a lip on the rim 17.

The container material should be resistant or reflective to microwave energy. This can be accomplished by providing the cardboard with a metal foil layer, either on the inside or outside surface of the container, as desired. Other materials, such as thermoplastic materials, heavy gauge metal foil, and the like can be used for the container, depending on cost, available machinery, and other factors. In any case, however, the container should be made of a material that is relatively impermeable to electromagnetic energy in the frequency range used for microwave ovens.

The dished cap 13 preferably is thermoformed from a sheet of microwave-transparent plastic material such as polyethylene or any other material conventionally used in packages of this type. The cap is designed to fit on the open top of the container in either a normal position (shown in FIG. 2) or an inverted position. For this purpose it is forced with an annular shoulder or flange 21 having a first surface or side 22 that rests on the rim of the container when

-9-

- the cap is in the normal position and a second surface or side 23 that rests on the rim of the container when the cap is in the inverted position. A first peripheral portion, preferably in the form of a skirt 24, extends
- 5 in a first direction from the shoulder and has an axially extending surface 25 that makes a tight telescopic fit with the open end of the container when the first surface 22 rests on the container rim. In the illustrated embodiment, the skirt 25 has an inner
- 10 annular ridge 26 that snaps over the rolled lip of the container to hold the cap securely on the container when the cap is in the normal position. An outwardly flared lower edge 27 facilitates guiding the skirt over the lip when snapping the cap onto the container in the normal
- 15 position.

A second peripheral portion, preferably in the form of an annular crown 28, extends in a second direction from the shoulder and has a surface 29 that pilots the cap to make a loose telescopic fit on the

20 open end of the container when the cap is in the inverted position with the second surface 23 of the shoulder resting on the container rim. The piloting surface 29 has a lower end 30 that connects to the shoulder and an upper end 31 that connects to an upper

25 end 32 of a peripheral side wall 33 of a central cup portion 34 having a bottom 35. The piloting surface 29 preferably tapers inwardly toward the upper end of the crown, and the side wall 33 of the cup portion preferably tapers outwardly toward the upper end of the crown. These tapers facilitate removing the cap from

30 the thermoforming mold, and the taper of the piloting surface also makes it easy to place the inverted cap on the container.

FIGS. 3 and 4 illustrate the steps of using

35 the container and cap to package a sundae-type frozen dessert and of preparing the packaging for consumption

-10-

of the product. They also illustrate the functions of each element of the cap in combination with the container to produce a packaged product simply and economically and subsequently to prepare the frozen
5 package for eating the product directly from the container.

Fig. 3a illustrates schematically delivering a flowable dessert mix 36 from a spout 37 to partially fill an open-top container 12. The dessert mix can be
10 any type suitable for a hot sundae-type frozen dessert, such as a mix for ice cream, ice milk, yogurt, custard, pudding, and so forth. After being filled to a predetermined level at a first station, the container proceeds to a second station (FIG. 3b) where a dished
15 cap 13 is fitted onto the rim of the container, with the central cup portion 34 of the cap opening upwards. This is the normal position of the cap.

The container then moves to the station of FIG. 3c, where a spout 38 delivers a melted topping 39 into the central cup portion. At the next station, shown in FIG. 3d, a cover 40 is applied to the upper rim of the crown to seal the topping material and protect it from contamination. The cover is preferably applied with a peelable adhesive or is otherwise applied
25 by means known in the art to permit easy removal by the ultimate consumer while assuring safety of the contents during transport and storage of the packaged product. To provide additional security, the skirt of the cap can be clamped to the lip of the container by a heat shrink
30 plastic band in a manner known in the art. Such a band could be applied to the package at any stage after the cap is snapped onto the container, but usually would be added after the central cup portion of the cap was filled and sealed.

35 After the filling and sealing steps of FIGS. 3a to 3d are completed, the packaged product is frozen

-11-

- and kept in the frozen state until time to be eaten by the ultimate consumer. FIGS. 4a through 4d illustrate the steps of preparing the product for eating. First, the cover 40 is peeled from the crown of the cap to
- 5 expose the frozen topping. At the same time, any tamper proof band, if provided, is stripped from the skirt of the cap. Next, the cap is unsnapped from the lip of the container, inverted, and replaced on the container, with the outer surface of the crown portion piloted inside
- 10 the open top of the container, as shown in FIG. 4b. The taper of the crown portion is preferably slightly greater than the taper of the side wall of the container, and the diameter of the crown portion where it connects to the shoulder 21 should be such that the
- 15 cap mates with a loose but not sloppy fit when the shoulder rests on the rim of the container in the inverted position. In this position, the exposed surface of the topping faces and is spaced above the surface of the frozen dessert mix.
- 20 The frozen package in the condition of Fig. 4b is then placed in a microwave oven 41 (Fig. 4c) and exposed to microwave energy for a period long enough to melt the topping layer in the microwave-transparent inverted cap. The hot melted topping flows from the cap
- 25 into the space left between the topping and the frozen dessert. The frozen dessert mix is shielded by the microwave-impervious impervious container and by the layer of topping, which absorbs most of the microwaves transmitted through the cap. A small amount of leakage
- 30 may occur at the junction of the side wall of the cup portion with the crown of the cap, but this will not be enough to significantly melt the frozen dessert mix if the connection between the upper ends of the piloting surface 29 and the side wall 33 of the cup portion is
- 35 kept as close as possible, consistent with maintaining the strength of the cap and ease of release from the

-12-

thermoforming mold.

From the preceding description, it is clear that the container and cap combination of the present invention provide an economical package that can be
5 filled and sealed on a straight line production system at normal room temperatures. The product is not frozen until all packaging operations are completed, making the production process simple and avoiding the need to operate machinery and assemble the package parts at low
10 temperatures. At the final consumption end of the process, the invertible cap provides a stably piloted arrangement, so that the cap will not shift out of alignment with the container when the package is placed in a microwave oven. At the same time, because the cap
15 rests loosely on the container rim when in the inverted position, any vapors generated during the heating step will vent easily, without creating excessive internal pressure.

Although the embodiment illustrated and
20 described above represents the preferred form of the invention, it will be appreciated that the invention may take other forms, within the limits of the appended claims.

-13-

IN THE CLAIMS:

1. A microwaveable package, comprising
a container having an open end with an upper
edge and adapted to hold a first frozen food, said
container being substantially impermeable to
microwave energy, and
a microwave-energy-permeable lid for said
container adapted for use either in a normal or
inverted configuration, said lid in its normal
configuration having a concave surface adapted to
hold a second frozen food, said lid including a
peripheral rim portion adapted to serve as a closure
for said open end of said container, and said lid in
its inverted configuration allowing said second
frozen food to be flowable and contact said first
frozen food when said package is exposed to
microwave energy.
2. The package of claim 1, wherein said lid includes a
peripheral shoulder portion opposite said peripheral
rim portion and adapted to rest upon said upper edge
of said container when said lid is inverted.
3. The package of claim 1, wherein said peripheral rim
portion comprises a flange adapted to make a snap
fit with said upper edge of said container, and said
peripheral shoulder is adapted to make a telescopic
fit with said open end of said container when said
lid is inverted.
4. The package of claim 1, further comprising removable
sealing means for sealing the second frozen food
within said concave portion of said lid during
storage of said product.

-14-

5. The package of claim 1, wherein said first food is an ice-cream-type product and said second frozen food is a topping.
6. A process for making a microwaveable ice cream sundae-type product, comprising
 - (a) introducing a first food into a substantially microwave-impermeable container until the container is partially filled, said container having an open end with an upper edge;
 - (b) providing a microwave-energy-permeable lid for the container adapted for use either in a normal or inverted configuration, said lid in its normal configuration having a concave surface adapted to separately hold a second food during storage, said lid including a peripheral rim portion adapted to serve as a closure for the open end of said container during storage, said lid in its inverted configuration allowing said second frozen food to be flowable and contact said first frozen food, said lid including a peripheral shoulder portion opposite said peripheral rim portion and adapted to rest on said upper edge of said container when said lid is inverted;
 - (c) fitting the peripheral rim portion over the upper edge of the container;
 - (d) introducing a second food into the said concave surface of the lid;
 - (e) placing a sealing cover over said concave surface of the lid; and
 - (f) freezing the sealed package.
7. The process of claim 9, further comprising
 - (g) removing said sealing cover from said lid when the product is to be eaten;
 - (h) inverting the lid and resting said

-15-

peripheral shoulder of said lid upon said upper edge of said container; and then

(i) subjecting the package to sufficient microwave energy to cause said second food to become flowable and pour down onto said first food.

8. A lid for applying a warmed topping onto an ice cream-type product and adapted for use either in a normal or inverted configuration,

said lid in its normal configuration having a concave surface adapted to hold a frozen food, said lid including a peripheral rim portion adapted to serve as a closure for an open end of a container partially filled with an ice cream-type product, and said lid in its inverted configuration allowing said frozen food to be flowable and contact said ice cream-type product when said package is exposed to microwave energy, said rim including a peripheral shoulder portion opposite said peripheral rim portion and adapted to rest upon an upper edge of said open end of said container when said lid is inverted.

9. In an improved microwaveable ice cream sundae-type package of the type wherein a first frozen food is contained in a cavity of a container which is impermeable to microwave energy and a second frozen food is contained in an area which is permeable to microwave energy, said container having an open end with an upper edge, wherein the improvement comprises

providing said package with a lid which is invertible from a normal configuration to an inverted configuration,

said lid in said normal configuration having a microwave-energy-permeable concave surface adapted

-16-

to hold said second frozen food, said lid including a peripheral rim portion adapted to serve as a closure for said open top of said container, and
said concave surface and said cavity defining a single compartment when said lid is in said inverted configuration,

said lid having a peripheral shoulder portion opposite said peripheral rim portion adapted to rest upon the upper edge of said container when said lid is inverted, said lid in its inverted configuration allowing said second frozen food to be flowable and contact said first frozen food when said package is exposed to microwave energy.

10. A microwaveable package, comprising

a container having an open end with an upper edge and adapted to hold an ice cream-type product, said container being substantially impermeable to microwave energy, and

a microwave-energy-permeable lid for said container adapted for use either in a normal or inverted configuration,

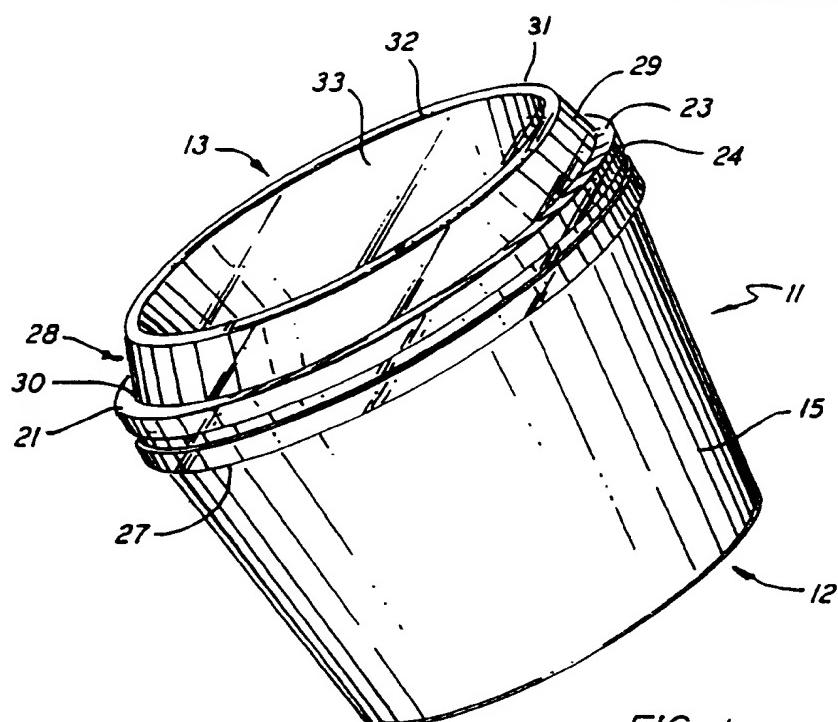
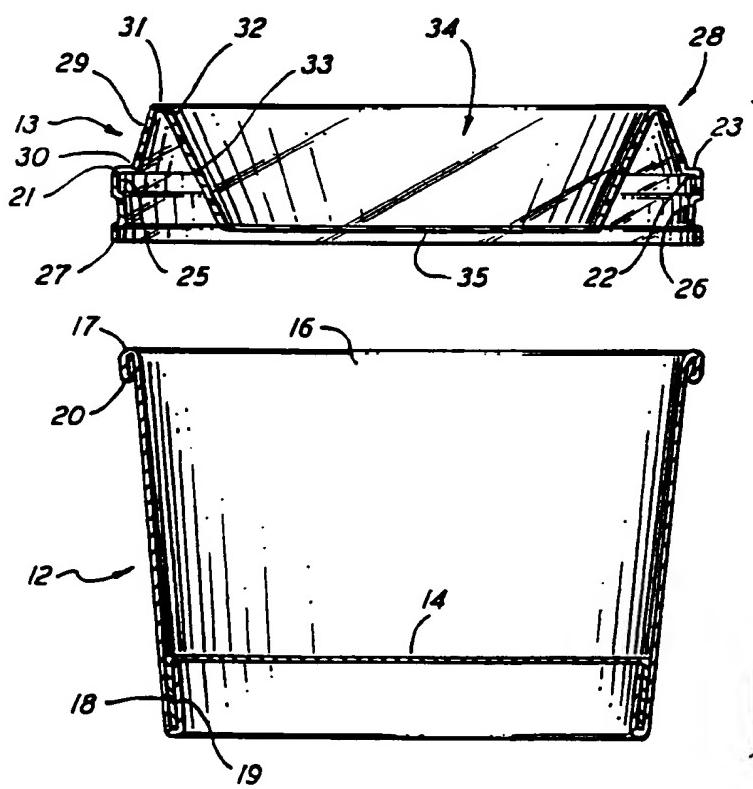
said lid in its normal configuration having a concave surface adapted to hold a topping for said ice cream-type food product, said lid including a peripheral rim portion comprising a flange adapted to serve as a closure for said open end of said container by making a snap fit with said upper edge of said container, and

said lid in its inverted configuration including a peripheral shoulder portion adapted to rest upon said upper edge of said container and to make a telescopic fit with said open end of said container,

said package including removable sealing means for sealing the topping within said concave portion

-17-

of said lid during storage of said package,
said sealing means being removed and said lid
being in its inverted configuration and allowing
said topping to be flowable and contact said ice
cream-type food product when said package is exposed
to microwave energy.

FIG. 1FIG. 2

2/3

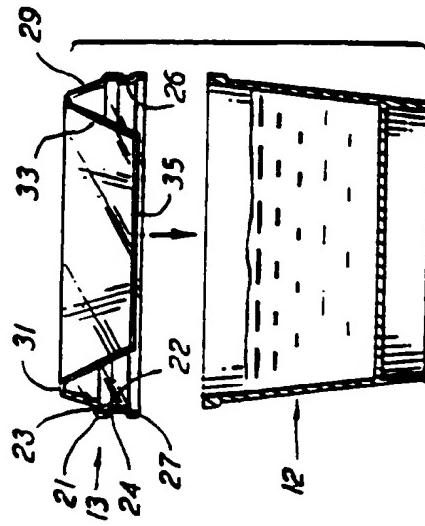


FIG. 3b

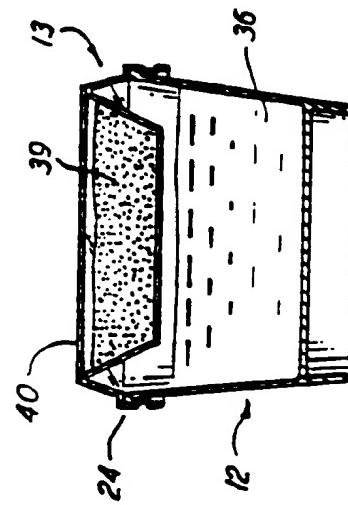


FIG. 3d

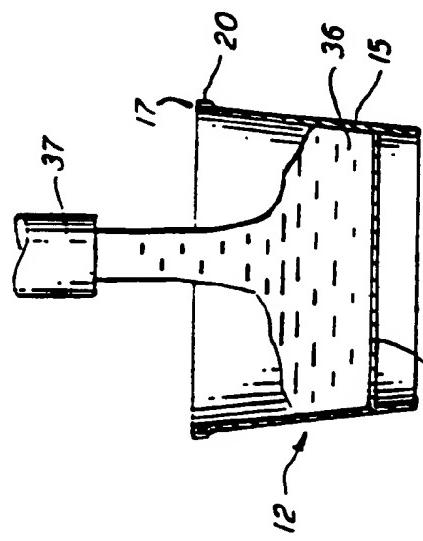


FIG. 3a

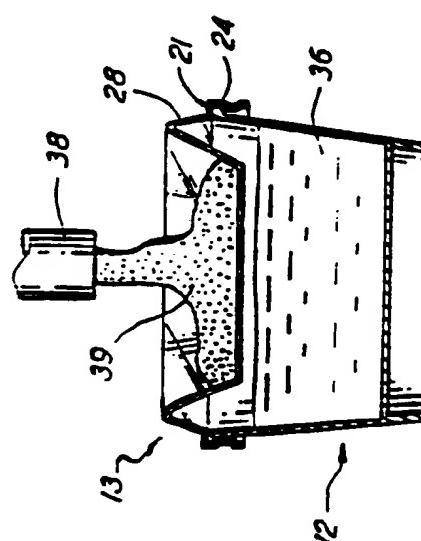


FIG. 3c

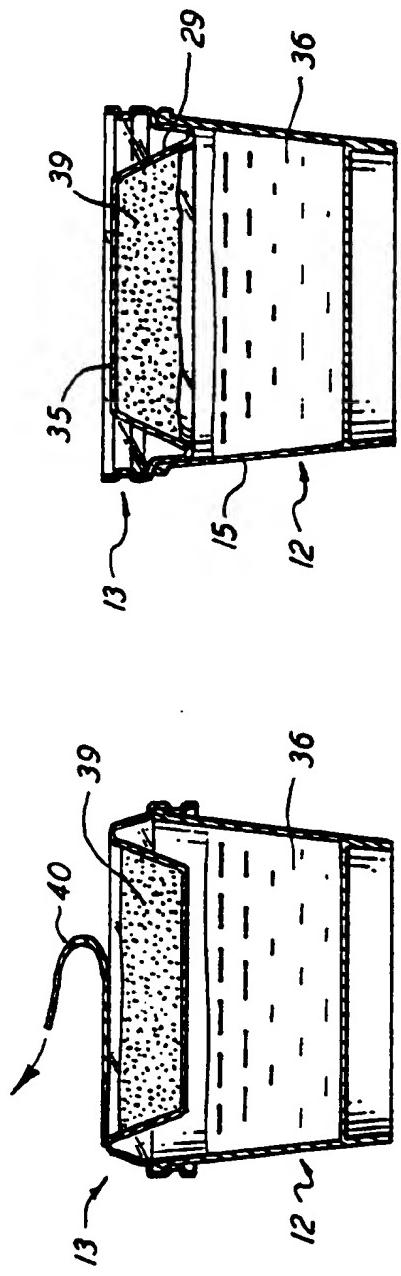


FIG. 4a

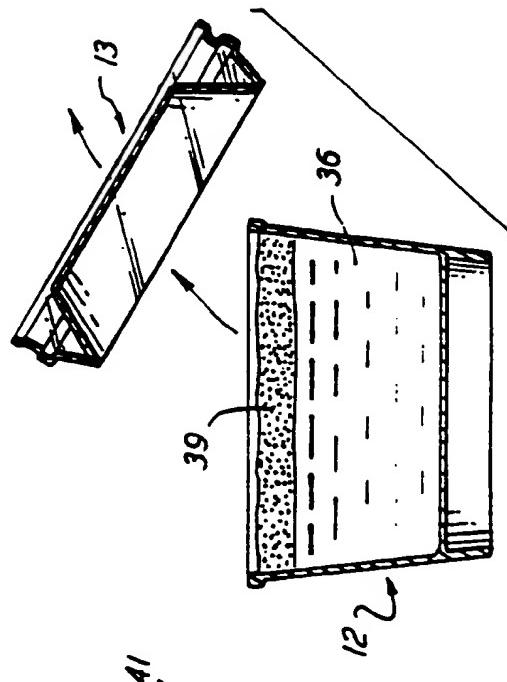


FIG. 4b

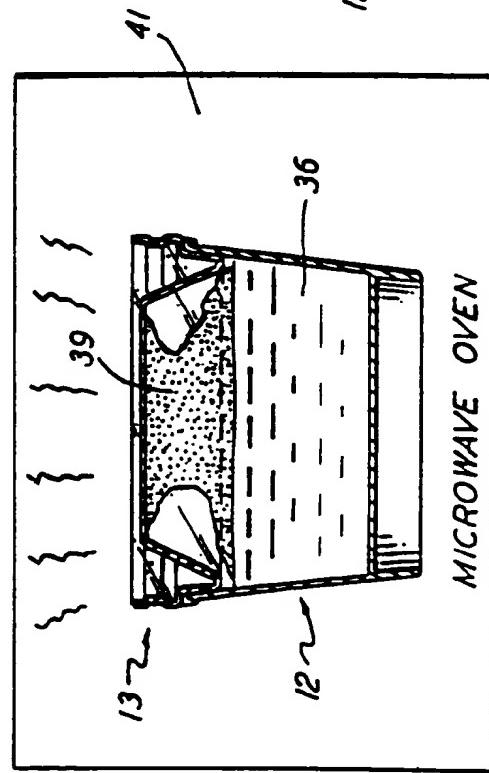


FIG. 4c

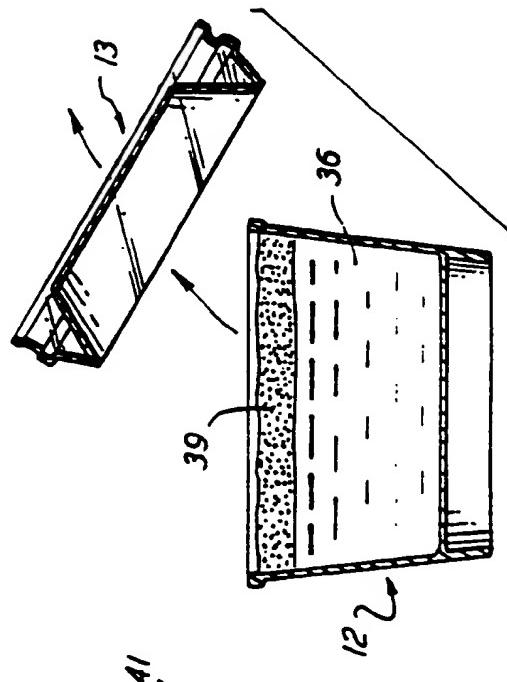
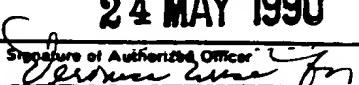


FIG. 4d

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US90/00426

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁴					
<small>According to International Patent Classification (IPC) or to both National Classification and IPC</small> IPC (5): B65D 81/32 U S CL: 426/107,115,120					
II. FIELDS SEARCHED					
<small>Minimum Documentation Searched?</small> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Classification System</th> <th style="width: 80%;">Classification Symbols</th> </tr> </thead> <tbody> <tr> <td style="height: 40px;">U S</td> <td style="height: 40px;">426/90,94,107,112,113,115,120,234,243; 220/23; 206/219,221</td> </tr> </tbody> </table>		Classification System	Classification Symbols	U S	426/90,94,107,112,113,115,120,234,243; 220/23; 206/219,221
Classification System	Classification Symbols				
U S	426/90,94,107,112,113,115,120,234,243; 220/23; 206/219,221				
<small>Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched?</small>					
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁵					
Category	Citation of Document, ⁶ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ³			
Y	US, A, 4,233,325, (SLANGAN et al.) 11 November 1980, See entire document.	1-10			
Y	US, A, 3,502,206 (HULTBERG et al.) 24 March 1970, See the entire document.	1-10			
Y	US, A, 2,766,796 (TUPPER) 16 October 1956,	1-10			
Y	US, A, 4,794,008 (SCHMIDT et al) 27 December 1988, See the entire document.	1-10			
Y	AT, B, 138,016 (MITTERBERGER) 25 June 1934, See the entire document.	1-10			
Y	US, A, 4,091,953 (DAENEN) 30 March 1978, See the entire document.	1-10			
<small>* Special categories of cited documents: ¹⁰</small> "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed <small>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "-&" document member of the same patent family</small>					
IV. CERTIFICATION					
Date of the Actual Completion of the International Search	Date of Mailing of the International Search Report				
01 MAY 1990	24 MAY 1990  Steven L. WEINSTEIN				
International Searching Authority ISA/US					